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3. The system of claim 1 wherein the search performed on each axis is a quaternary or higher-level M-ary search, where M is a power of 2, conducted

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9. The system of claim 8 wherein applicable rules for each interval on each axis are represented by individual bitmaps, with each rule assigned a bit position, and wherein the outputs of the parallel pipelines, being the numbered interval on each axis into which the point for a packet projects, are exchanged for the associated bitmaps, which are then ANDed to determine the applicable rules.

10. The system of claim 1 wherein searching is interleaved, results of searching on one or more axes being applied to other axes before searching on the other axes.

11. The system of claim 10 wherein rules that are found by search to not apply on one or more axes are not considered in searches conducted on the other axes.

12. A method for classifying packets in routing, wherein each packet has N fields to be used in processing in a header, comprising the steps of:

- (a) projecting the rules as N-dimensional entities on N axes in N-dimensional space;
- (b) marking the beginning and ending value on each axis for each rule as a breakpoint;
- (c) numbering intervals on each axis sequentially with binary numbers;
- (d) identifying those breakpoints at which bits in the interval numbers change;
- (e) associating a subset of the rules as applicable in each interval on each axis;

(f) considering a packet as a point in the N-dimensional space according to values of the header fields for the packet;

(g) determining by search the binary numbered interval on each axis to which the packet point projects;

(h) substituting the subset of rules that apply for each determined interval; and

(i) selecting those rules as applicable to the packet that associate to packet on all of the N axes.

The method of claim 10 wherein, in step (g) the determination is made by a binary search.

The method of claim 12 wherein, in step (g), the determination is made by a quaternary or higher-level M-ary search.

The method of claim 12 wherein, in step (e), association of applicable rules in each numbered interval is made by associating a binary string with each interval, with one bit dedicated to each rule.

The method of claim 15 wherein the rules are mapped to bit positions in the binary string by priority, the order of priority according to bit significance, and a final rule is selected by the most significant 1 in the matching rules.

The method of claim 15 wherein, in step (i), the matching rules are found by ANDING the binary strings determined for each axis over all axes.

(g) determining by search the binary numbered interval on each axis

(h) substituting the subset of rules that apply for each determined

(i) selecting those rules as applicable to the packet that associate to

13. The method of claim 10 wherein, in step (g) the determination is made

14. The method of claim 12 wherein, in step (g), the determination is made

15. The method of claim 12 wherein, in step (e), association of applicable

16. The method of claim 15 wherein the rules are mapped to bit positions in

17. The method of claim 15 wherein, in step (i), the matching rules are found

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18. The method of claim 12 wherein, in step (g), the search is conducted by sequential modules in at least one hardware pipeline, the pipeline comprising first, second, and sequential modules for accomplishing increasingly particular portions of the search, and wherein, after the first module of the sequential modules is used, determined values from the first module pass to the second module, and values for a second packet enter the pipeline at the first module, the pipeline operations proceeding thus sequentially.

19. The method of claim 17 comprising parallel pipelines with one pipeline dedicated to searching on each axis in the N-dimensional space, wherein searches are conducted for applicable interval simultaneously on each axis.

20. The method of claim 19 wherein applicable rules for each interval on each axis are represented by individual bitmaps, with each rule assigned a bit position, and wherein the outputs of the parallel pipeline, being the numbered interval on each axis into which the point for a packet projects, are exchanged for the associated bitmaps, which are then ANDed to determine the second set of matching rules.

21. The method of claim 12 wherein, in step (g) searching is interleaved, results of searching on one or more axes being applied to other axes before searching on the other axes.

22. The method of claim 21 wherein rules that are found by search to not apply on one or more axes are not considered in searches conducted on the other axes.

(a) conducting a first search on one or more axes; and

(b) using information from the ~~first~~ search to simplify further

[illegible]

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